

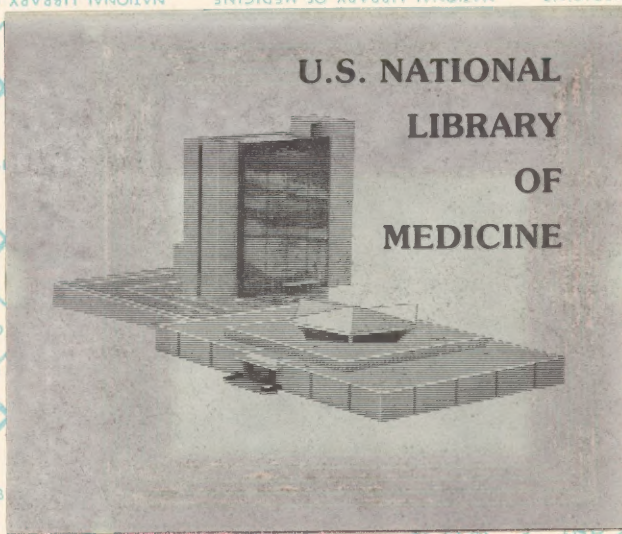
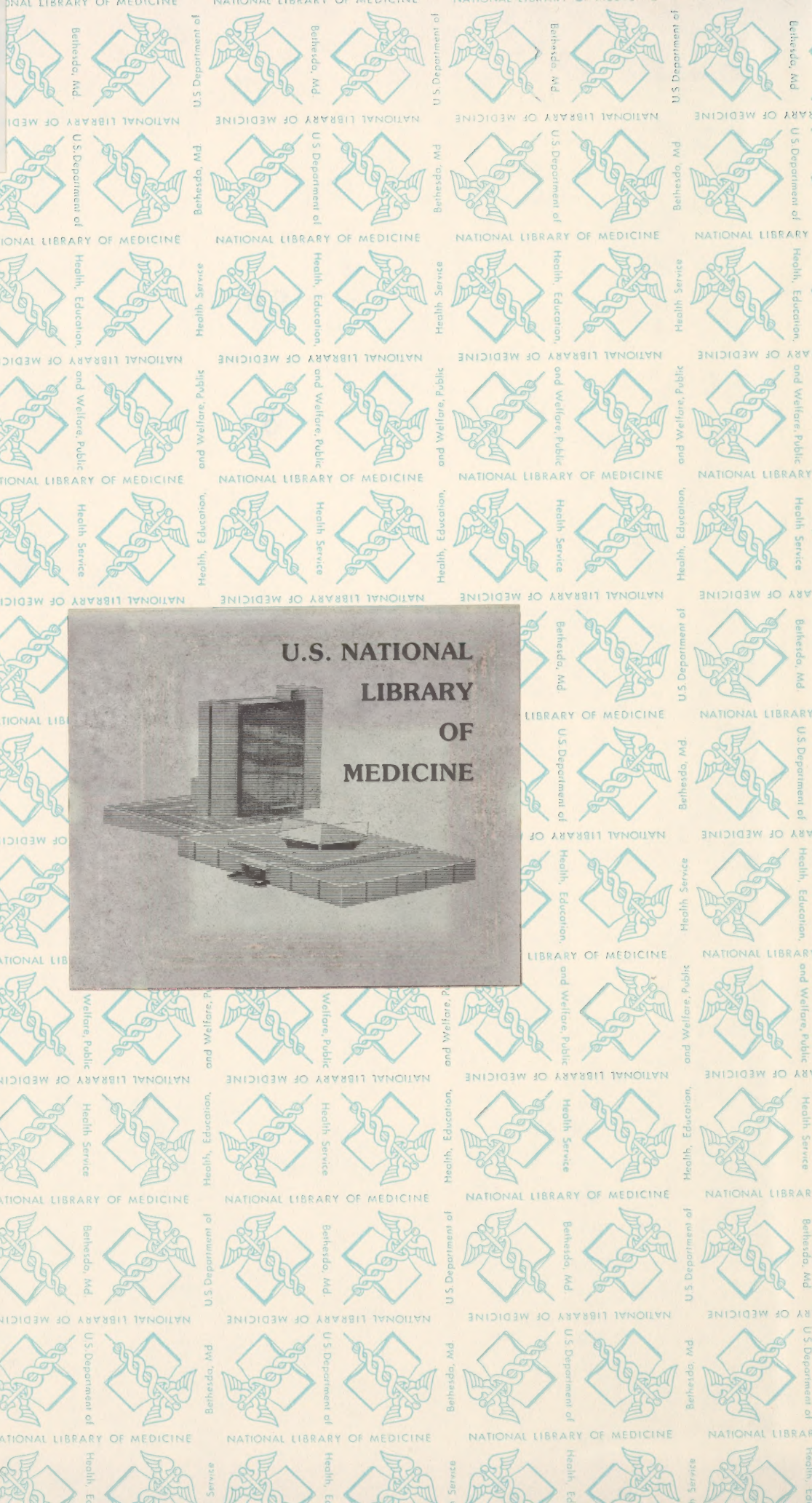






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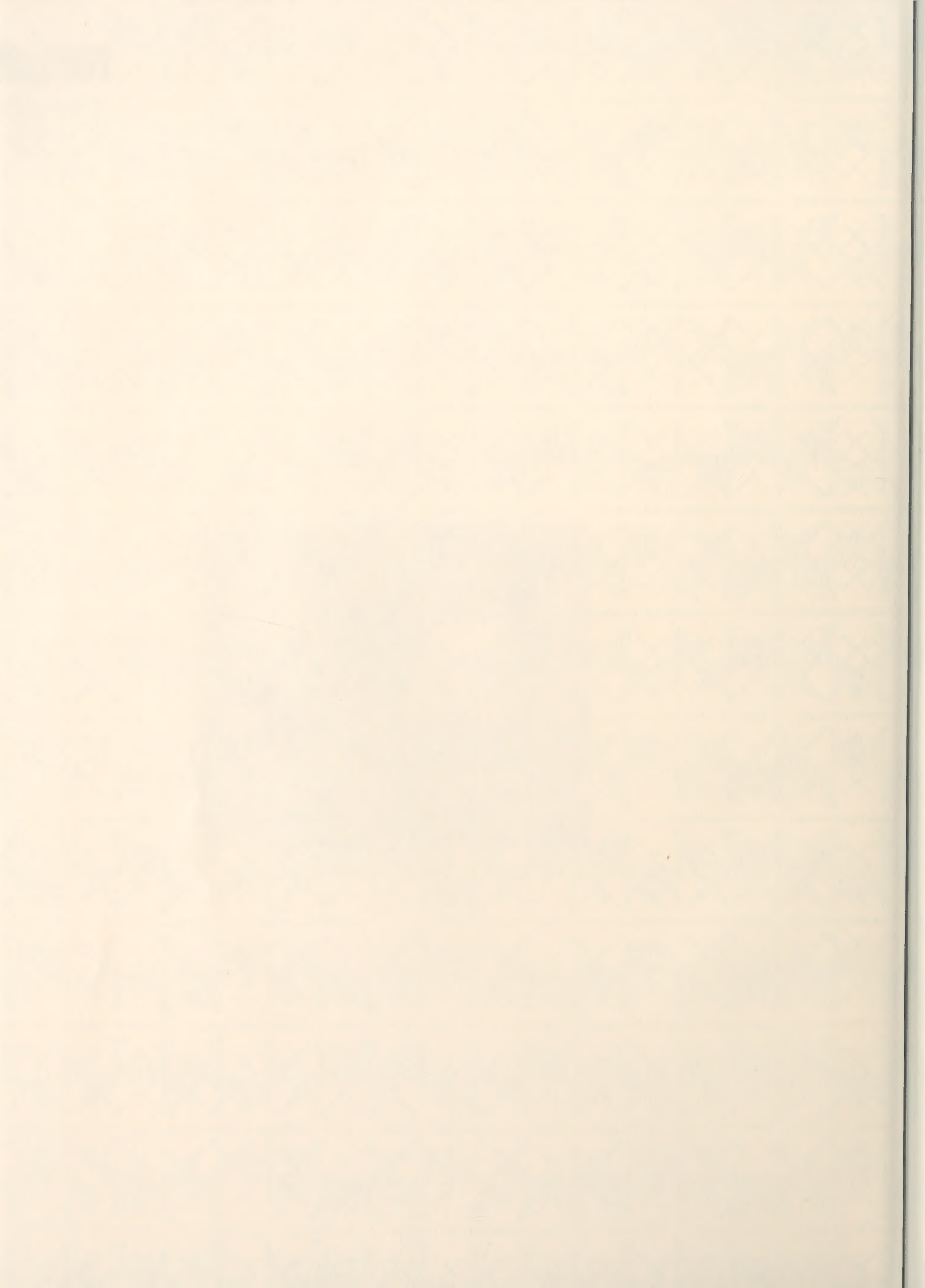


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# INSTITUTIONAL OUTBREAK of HEMOLYTIC STREPTOCOCCI (Scarlet Fever)

INVESTIGATION and REPORT  
FROM THE BUREAU OF COMMUNICABLE DISEASES  
LOS ANGELES CITY HEALTH DEPARTMENT

by

HYMAN I. VENER, M.D., C.P.H.,  
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INSTITUTIONAL OUTBREAK OF HEMOLYTIC STREPTOCOCCI  
(Scarlet Fever)

Investigation and Report\*

by  
Hyman I. Vener, M.D., C.P.H.,  
Assistant Epidemiologist.

George M. Stevens, M.D.,  
Epidemiologist.

The Bureau of Epidemiology was notified on March 14, 1939 that a number of cases of scarlet fever had been admitted from the Los Angeles County Juvenile Hall to the Communicable Disease Division of the Los Angeles County Hospital. An immediate investigation was launched by George M. Stevens, M.D., Epidemiologist, and Hyman I. Vener, M.D., Assistant Epidemiologist.

Interviews were obtained from Dr. Herman W. Covey, Medical Director, Miss Rhea C. Ackerman, Superintendent, and Mrs. George P. Payne, Assistant Superintendent. A preliminary tour of inspection was made, and plans instituted for a complete survey of the institution. In this investigation we were assisted by Mr. Conrad Peterson, R.N., of the Bureau of Quarantine.

Each of the 245 children, ages 6 to 19 years was interrogated and from data thus obtained, tables and graphs were formulated, constituting part of this report. The reliability of some of the replies obtained from the children may be questioned. In the majority of instances, however, we felt that the replies were sincere and to the children's best ability.

The fullest cooperation and courtesy was extended by the entire personnel of the institution, which made it possible to conduct the survey with a minimum of confusion and loss of time.

GENERAL DESCRIPTION OF INSTITUTION

The Los Angeles County Juvenile Hall Institution is located at 1369 Henry Street, Los Angeles, California, approximately one block north of the northern boundary of the Los Angeles County Hospital. (MAP) It was created by law and prior to the court appearance of the children, serves as their

\*From the Bureau of Communicable Diseases,  
Los Angeles City Health Department.

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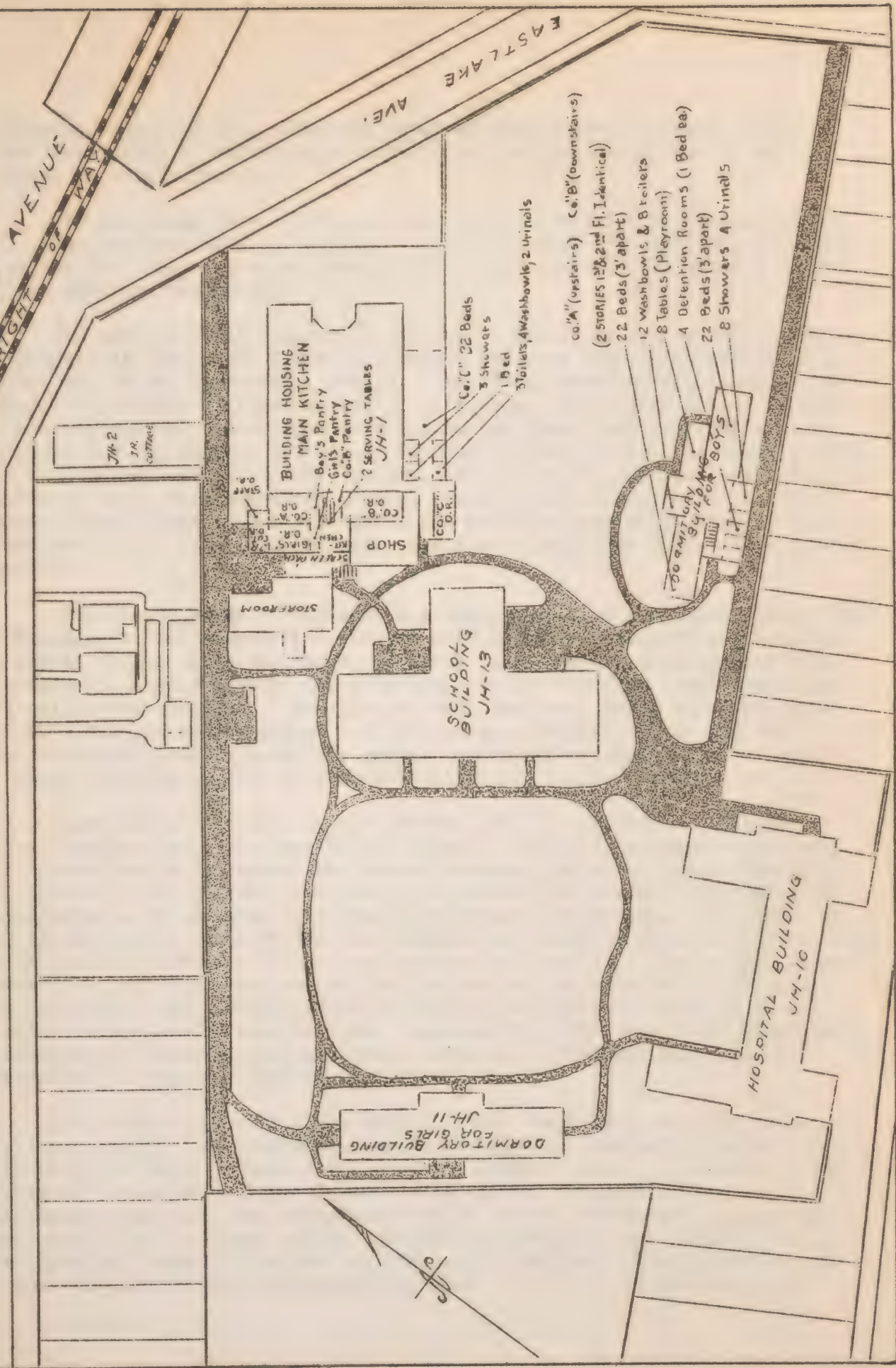




MISSION

ALHAMBRA AVENUE  
V.P.R.R. RIGHT OF WAY

EAST LAKE AVE.







detention home and as a means for studying their mental hygiene status. The Institution is under the control of Los Angeles County and is supported by county taxes.

The governing body of the Institution consists of a Probation Committee, a superintendent, an assistant superintendent, a medical director and assistants. The entire personnel numbers approximately 110 and their functions are many and varied.

The medical staff consists of Dr. H. W. Covey, Medical Director and Psychiatrist; Dr. M. P. Frior, Assistant; Dr. Etta Gray, part-time physician; and Dr. W. H. Burrell, dentist. Dr. Covey examines all the boys and prepares psychiatric reports dealing with cases that are to appear in court. A similar service is extended to cases coming from other institutions through the Out-patient Division. Dr. Marion Frior assists in these psychiatric studies. Dr. Etta Gray, a part-time physician, examines all the girls, conducts daily ward rounds as needed; renders special treatments to the girls; administers diphtheria toxoid and performs tuberculin skin tests as indicated. Dr. Wilford H. Burrell, conducts a part-time dental clinic twice weekly.

The present group of thirteen buildings were completed about 1929. The buildings include dormitories for the male and female children, a hospital, a public school under the direct supervision of the Los Angeles City School Department, a main kitchen for preparing and distributing foods, and other miscellaneous buildings. Assigned to each dormitory are a variable number of boys and girls, segregated into companies according to age and sex. Intermingling between dormitory groups is forbidden; segregation of each company is enforced both in play activities and living quarters.

Approximately 17 days is the average stay of a child in the institution, during which time they attend school. The daily average population is approximately 250 cases; the annual average population is approximately 4500 cases. Despite the large child population, no resident physician is available on the grounds to render 24 hour medical service. The large and rapid population turnover does not permit individual or group isolation, and with present facilities is not practicable or possible. During 1938, there were 5,265 children detained in the institution for study and disposition. In addition, 1,396 children were brought to the clinics for study from various other county institutions. Consequently, the two groups undoubtedly intermingled rather freely and could serve as a possible source in the spread of the various infectious diseases.

The usual routine of a new admission and the subsequent stay is as follows:-- A history is obtained and a preliminary examination made. If the child is found to have a temperature, cough or rash, it is sent to the hospital isolation unit for further observation. Members of the younger age groups, assigned to living quarters in Junior Cottage and Company C., are sent direct to these units. The boys of the older age groups usually are detained overnight in the hospital unit, and the following morning assigned to their respective companies. The older girls are detained for





several days in the hospital isolation unit until special reports of smears and blood tests are received, then they are assigned to various living quarters.

In the assigned company the child is under constant supervision by a specially trained attendant. The children take daily showers, and are observed for evidence of any skin eruptions. If a child appears to be ailing or a rash noted, the case is reported. A clinic nurse makes rounds twice daily of the various companies, and supervises the children requiring special treatments, or makes preliminary inspections of new patients. Daily temperature recordings are not made and no sustained search enforced for evidence of desquamation of the hands or feet. Consequently, a child ill for several days but who for some reason fails to report his condition may, unless detected by the nurse or attendant, continue his normal activities. Therefore, a missed case of scarlet fever either during the clinical phase or in the subsequent stages, may cause an outbreak of the character herein described. Especially is it probable, if the ill child is suffering from the complications of scarlet fever, such as sinusitis, otitis media or paronychia, while employed as a food handler.

#### IMMEDIATE MEASURES INSTITUTED

1. Dispensing of bulk milk was discontinued, except for cooking purposes.
2. Bottled milk was to be used exclusively for drinking and served preferably with straws through the cap opening.
3. Discontinuance of boys as kitchen helpers until the epidemic had subsided, (a procedure instituted on March 11).
4. All children found to be desquamating were isolated in a separate unit. All children with a recent history of sore throat, and confirmed by positive throat cultures for hemolytic streptococci were isolated in a separate unit.
5. All clinical and suspicious cases were transferred to the Communicable Disease Unit of the Los Angeles County Hospital.
6. A strict quarantine was established, and no new cases were admitted to the institution.
7. An immediate survey was instituted to investigate the milk supply, as well as various other foods suspected as responsible agents.
8. A clinical and epidemiological investigation was instituted, correlation of data eventually made, and recommendations for the future management submitted.





## EPIDEMIOLOGICAL INVESTIGATION -- CONDUCT OF SURVEY

A complete survey of the institution was made, particular attention was given to the housing facilities, the kitchens and the manner of handling food. Every child was interviewed and, if indicated, briefly examined for evidence of desquamation of the hands or feet. Whenever warranted, this examination was supplemented with throat cultures for hemolytic streptococci.

Every child was questioned regarding age, company residence, history of recent sore throat, past history of scarlet fever, work assignment during the first ten days of March, and also as to likes or dislikes of certain foods which appeared on the menus, which might have served as possible vehicles for the outbreak.

Each company was considered a complete and separate unit. An effort was made to correlate the case incidence by age, sex, color, work assignments during the first week of March, the amount of milk consumed, the foods that might have served as a favorable culture media for the hemolytic streptococci, the source of the milk and ice cream, and the manner of storing and handling the various foods.

### KITCHEN

The main kitchen was used as the focal distributing unit for the other buildings of the institution. Food was prepared in the main kitchen and served directly to the several adjoining dining rooms, which were used by Companies A, B, C, Girl's Department and the Junior Cottage. The boys segregation group and the Nightingale unit, both in the hospital building were serviced by food carts from the main kitchen to the hospital kitchen, thence to two separate dining rooms, adjoining or on individual trays direct to those held on the isolation wards. Food served to Company C was handled in the main kitchen only by the hired personnel. Their food was placed on trays near one of the exits and picked up and carried by a member of Company C to his fellow companions. This messenger did not contact members of any other unit during the course of his duties.

The girls' dining room was served by different girls who acted as waitresses, and the food was given them directly by the hired kitchen personnel. The girls were not allowed to come into the kitchen. The boy's dining rooms were served by boy waiters, and others who worked as helpers in the kitchen. Each company had its individual dining room and did not contact other units. All sterilization procedures were performed by the hired personnel and not entrusted to the inmate kitchen helpers. The latter however, did wipe and stack the dishes on the shelves.

### KITCHEN PERSONNEL

The hired personnel did not eat in the institution. With one or two exceptions, none of the institution personnel ate any meals prepared in the kitchen. All either brought their lunches or ate out at nearby restaurants.





At the time of the investigation, March 25, 1939, not one of the employees had been ill with scarlet fever, or gave a history of recent sore throat. Several members of the staff were ill at home due to apparent colds, but they were not examined for hemolytic streptococci.

The boys from Company A and B were assigned for kitchen detail as follows:-- At 6:00 A.M. six boys were detailed to the main kitchen, but two of this number left for school at 9:00 A.M. For the noon meal, five boys helped in the kitchen. Two boys each from Company A and B remained in the different dining rooms to clean up. At the hospital dining room, a similar plan was followed.

No definite time limit was assigned to any boy. The turnover was very great and the boys intermingled freely. Therefore, the possibility of constant exposure to a contagious disease, such as scarlet fever, cannot be overlooked. The boys detailed as kitchen helpers washed dishes, assisted in making salads, poured milk, and frequently served food from the pans onto the large serving dishes to be distributed to the various adjoining dining rooms.

#### MILK

The entire bulk milk supply was pasteurized and furnished by the Los Angeles County Farm. The bulk milk was shipped in 10 gallon cans to the main kitchen. Daily shipments averaged approximately 76 gallons and the supply was used for cooking and drinking. The average daily consumption of milk per child was 1.2 quarts per day.

Examination of the milch herd and of conditions at the County Farm was made by Dr. F. B. Wilcox, Chief Dairy and Milk Inspector of the Los Angeles County Health Department. He reported no evidence of mastitis or udder trouble in any of the cows.

Pasteurization records were found to be accurate and the phosphatase test indicated proper pasteurization. No cases of scarlet fever had occurred at the County Farm. The daily disposal of 700 gallons of milk from the County Farm had been traced, but no cases of scarlet fever had occurred.

At Juvenile Hall the milk was found to be stored in the refrigerators in 10 gallon cans. The thermometers were working satisfactorily. For immediate consumption, the milk was poured from the large cans into three or five gallon granite crocks, and thence again poured into smaller pitchers for table consumption. The larger pitchers were also used to transport milk to other units of the institution. The pouring of the milk from one container to another was performed by the boys assigned to work in the kitchen.

The women working in the kitchen were unable to move the heavy containers very readily. A few, however, did pour the milk from the three gallon granite crocks into the pitchers.

The hired personnel after each meal washed for  $1\frac{1}{2}$  to 2 hours all granite crocks, pitchers, dishes and utensils with soap and hot water and





sterilized them. The sterilizers functioned properly. The crocks and pitchers were allowed to dry and were placed bottoms up on the nearby pantry shelves. A great deal of dust was revealed on the exposed portion of the cupboard where the granite crocks were stored. The crocks were clean, but some were chipped exposing the underlying surface. The milk pitchers were stored on shelves in an enclosed cupboard, mouths up, uncovered and easily could become contaminated with dust.

The refrigerator in the hospital kitchen on several visits revealed quantities of left-over milk, standing for two or three hours from the previous meal, stored in an uncovered granite crock on the floor. The opportunities for contamination were most excellent and similar situations could have existed in the past of which we were unaware. The milk thus stored was used as a reserve supply for the various adjoining dining rooms in case of shortage during meal time.

A summary of answers received from some of the boys who had worked in the kitchen at various times were compiled. To avoid the possibility of eavesdropping each boy was questioned separately. Too much credence should not be given to the replies of many of those questioned, owing to the type of individual and the opportunity of such person to become fanciful. On the whole, due consideration must be given to the uniformity of the answers received, which in brief were as follows.

The milk was poured from the 10 gallon cans into the three and five gallon granite basins by the boys assigned to the kitchen detail. Frequently, the milk was allowed to stand uncovered at room temperature, until the following meal, the time interval of which varied from one to four hours, depending on instructions when to pour the fresh milk for the next meal. At times the crocks were cleaned only with hot water and not sterilized, but kept out in the open and refilled with fresh milk the next day.

Some of the hired kitchen personnel occasionally would be in a hurry to complete their duties and would not take time to sterilize the various utensils. Instead they would order the boys on the kitchen detail to perform this duty. Milk that remained in the smaller pitchers was poured into larger pitchers and later used for cooking, and occasionally for drinking. The boys working in the kitchen detail admitted that if unobserved, they would drink milk out of the pitchers. They thought nothing of this "stunt" and considered this act one of the just rewards for their duties.

#### OTHER FOODS

On the days when custards or puddings were to be served, it was prepared during the early part of the morning, and allowed to cool in a large basin on a shelf at room temperature. If the dessert was to be served for lunch, it was thus exposed for about five hours, and if served for dinner, eight to ten hours would elapse from the time of preparation to the time of consumption. At all times, the product was only covered with a muslin cloth.





A supply of custard was observed cooling during one of our inspections. It was very appetitizing, and one was sorely tempted to revert to an old boyhood habit of sticking the fingers into the dessert and sampling. The same thought might not only have been entertained by boys working in the kitchen, but actually performed, particularly if they felt they were unobserved. A very likely source of contamination was thus possibly detected. It could not have been at all improbable for one of the kitchen helpers who might have been a clinical case or a missed case of scarlet fever to contaminate the product, which serves well as a culture media and conveyor for the streptococci.

Gelatin served on March 8, had been prepared several days earlier, but had been kept in refrigeration until just prior to serving.

### CLINICAL CONSIDERATIONS

All clinical cases, immediately upon detection, were transferred for the period of quarantine to the Communicable Disease Division of the County Hospital for active management. At the termination of the quarantine, the patient was transferred to the institution and kept in isolation an additional week. In the simple uncomplicated case, this additional period of quarantine results only in overcrowding of the valuable and limited isolation facilities. Such a procedure should not be routine, but instituted only if a complicating drainage occurs after dismissal from the Communicable Disease Hospital.

Missed cases were classified as patients with a history of recent sore throat, fever, or a feeling of "being indisposed," and evidence of desquamation of the fingers, hands, toes or feet. These patients were isolated for the regular quarantine period. Patients with a history of sore throat of recent origin were examined, and if acute inflammation observed, they were isolated and cultures were taken for hemolytic streptococci. If these cultures were negative, the patients were released; but if positive, they were isolated until repeated throat cultures were negative. Culture examinations for hemolytic streptococci were performed by Dr. L. V. Dieter, Director of the City Health Department Laboratories, and by Dr. Roy Fisk, Director of the Communicable Disease Laboratories of the County Hospital.

Twenty-seven cases of clinical scarlet fever, sixteen missed cases of scarlet fever and thirty-five cases of positive hemolytic streptococci cultures occurred. Approximately 32% of the total population of the institution had some type of a streptococcal infection.

The annual incidence for the period 1930-1939 (March 25 inclusive), revealed that outbreaks had occurred in 1930, 1933, 1934 and the current one. (Graph A) During the past nine years, the highest monthly incidence occurred during the winter months, namely, November, December, January and February. (Graph B)





In January, 1939, two cases of scarlet fever occurred. In February, two additional cases occurred. The first case was in a girl on February 20; and the second was a missed case in a boy on February 25. During the survey this boy was discovered to have a marked cervical adenitis, a moderately sore throat which subsequently upon culture was positive for hemolytic streptococci. His duties consisted of serving, washing and assisting in preparing some of the salads and food for the other children.

During the first week of March, a missed case of scarlet with an approximate onset on March 2 occurred in a boy. On March 3, a clinical case occurred in a male kitchen helper. On March 6, another clinical case occurred in a kitchen helper. The same day, another kitchen helper became ill from whose throat, on subsequent culturing, positive hemolytic streptococci was reported. It is very probable that the explosive outbreak that occurred 48 hours later, namely, March 8, could have been due to these two cases.

The onset of the epidemic began March 8, reached the peak on March 9 and 10th, and as the emergency measures mentioned were instituted, subsided approximately one week later. (Graph C)





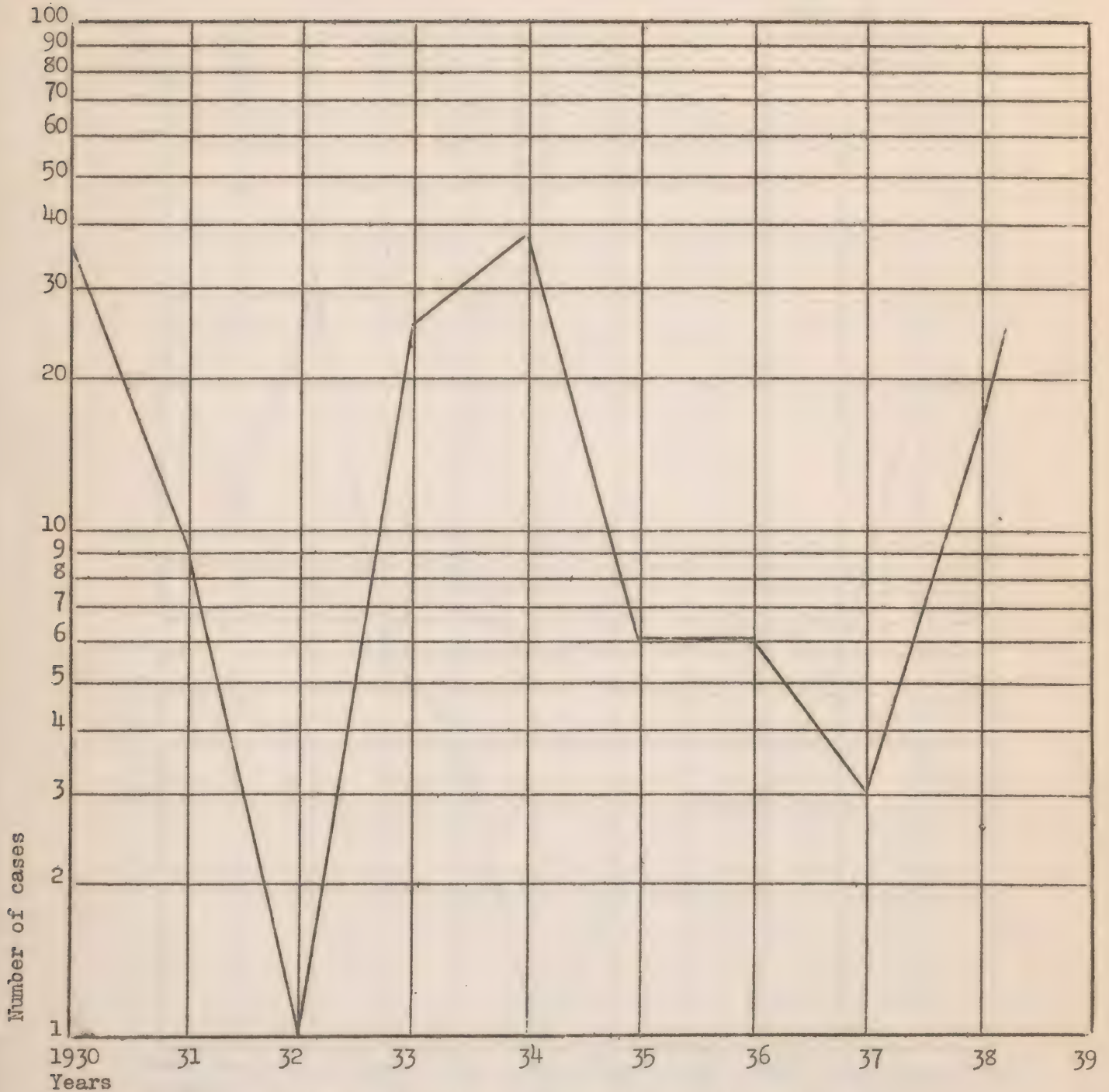
# SCARLET FEVER IN JUVENILE HALL

Showing

INCIDENCE BY YEARS

(1930-1939 Inclusive)\*

Graph A.



\*To March 25, 1939. (Clinical Cases only considered.)





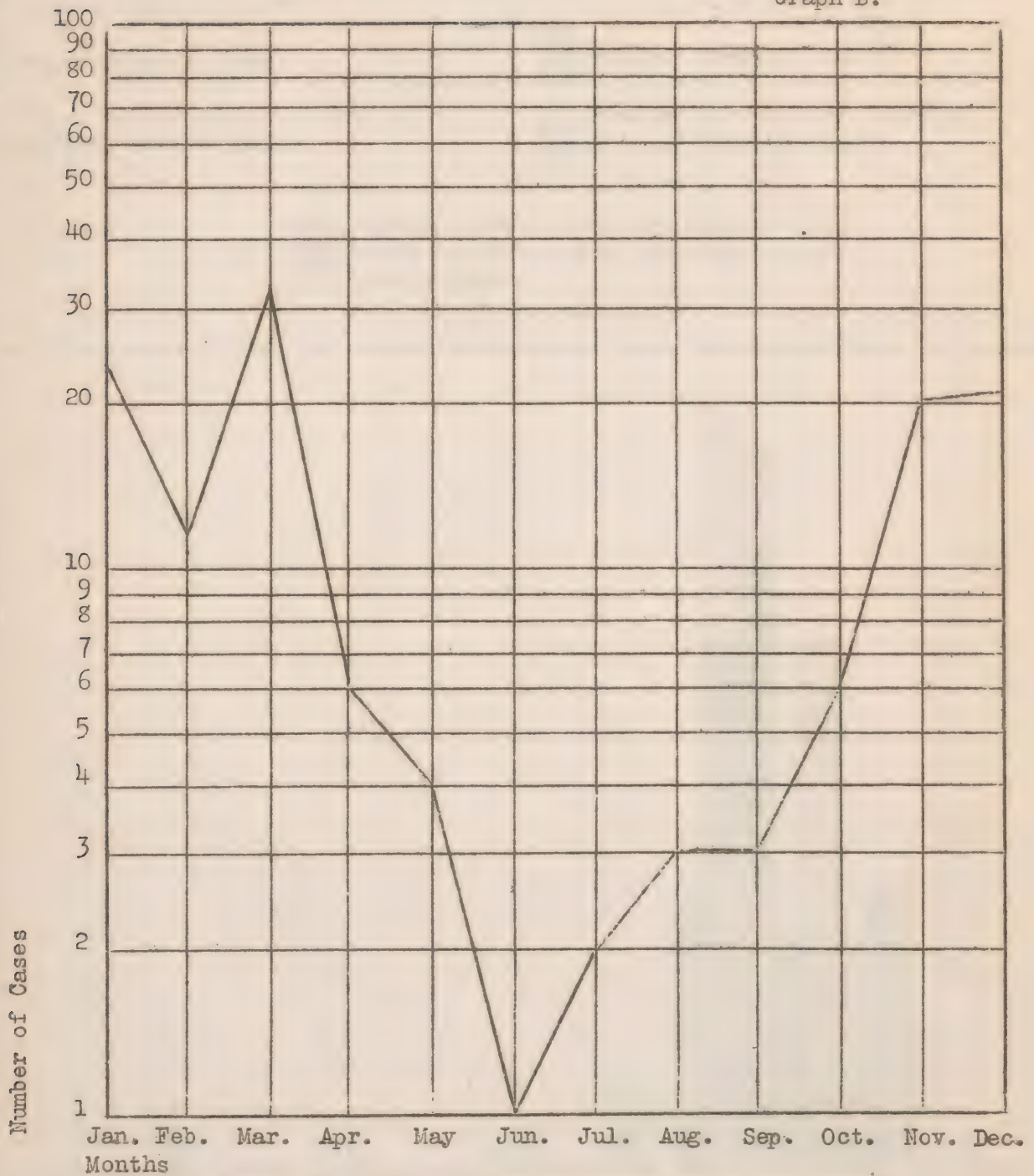
SCARLET FEVER IN JUVENILE HALL

SHOWING

INCIDENCE BY MONTHS

(1931-1939 Inclusive)\*

Graph B.



\*To March 25, 1939. (Clinical cases only considered)





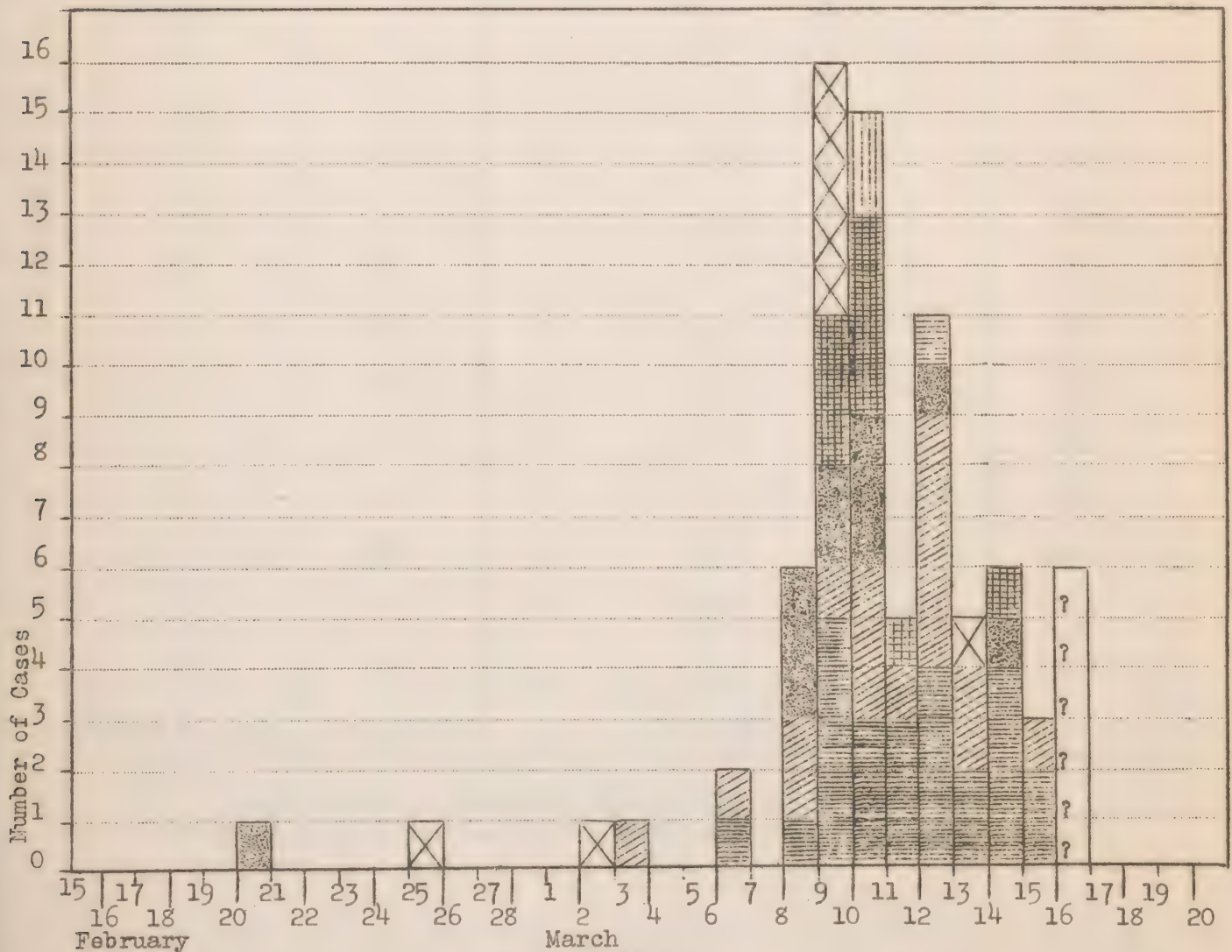
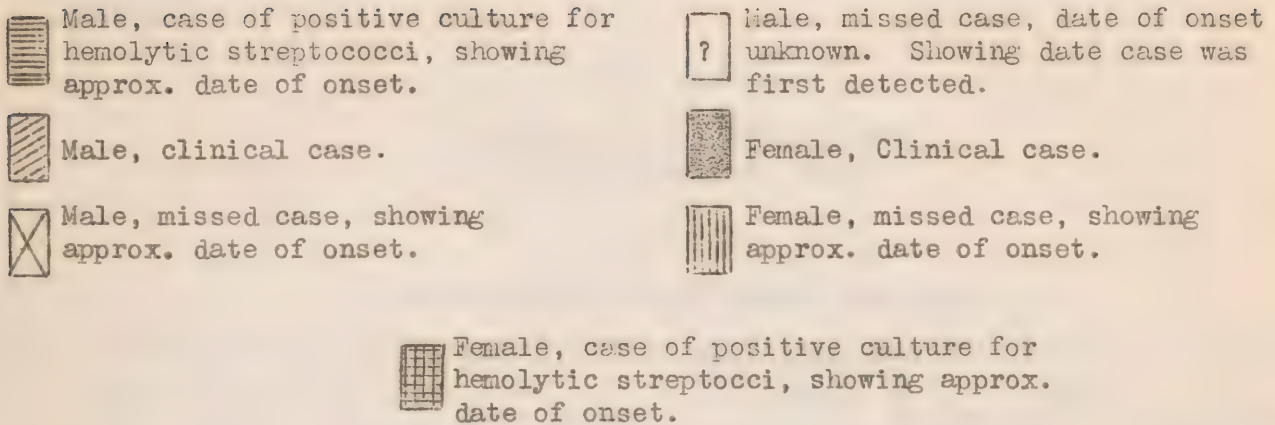
# SCARLET FEVER IN JUVENILE HALL

Showing

DAILY INCIDENCE

FEBRUARY 15 to MARCH 20, 1939.

GRAPH C







# POPULATION

The population of the institution at time of the investigation was 245; 155 or 63% were males and 90 or 37% were females. (Table I.) Distribution by race revealed that 68% were whites, 22% Mexicans and 10% negroes.

T A B L E I.

## POPULATION OF JUVENILE HALL

As of March 14, 1939.

Showing

### DISTRIBUTION BY AGE GROUPS AND SEX.

AGE IN YEARS	MALE POPULATION	DISTRIBUTION OF MALE POPULATION PERCENT	FEMALE POPULATION	DISTRIBUTION OF FEMALE POPULATION PERCENT	TOTAL	
					POPULATION	PERCENTAGE DISTRIBUTION
- 8	4	2.6	9	10.0	13	5.3
8	2	1.3	4	4.4	6	2.5
9	5	3.4	2	2.2	7	2.9
10	4	2.6	3	3.3	7	2.9
11	7	4.5	1	1.1	8	3.3
12	5	3.4	1	1.1	6	2.5
13	17	10.9	5	5.5	22	8.2
14	28	18.0	16	17.7	44	18.0
15	55	35.5	16	17.7	71	29.0
16	19	12.2	19	21.1	38	16.0
17	7	4.5	11	12.2	18	7.4
18+	2	1.3	3	3.3	5	2.0
TOTALS	155	100.2%	90	99.6%	245	100.0%

Employed in various capacities were 109 persons, (34 men, 75 women), none of whom to our knowledge developed scarlet fever.





### CLINICAL CASES:-- DISTRIBUTION

Using the classical symptoms and signs of scarlet fever, as a guide, 11% of the population developed clinical manifestations. (Table II.)

T A B L E II.

#### SCARLET FEVER CLINICAL CASES

Showing

#### INCIDENCE DISTRIBUTION BY AGE GROUPS.

AGE IN YEARS	POPULATION	NUMBER OF CASES	CASE INCIDENCE DISTRIBUTION PERCENT	PERCENT DISTRIBUTION OF TOTAL CASES
- 8	13	1	7.7	4.0
8	6	1	16.6	4.0
9	7	0	-	-
10	7	2	28.5	7.4
11	8	0	-	-
12	6	0	-	-
13	22	0	-	-
14	44	6	13.6	22.2
15	71	12	17.0	44.4
16	38	2	5.3	7.4
17	18	2	11.1	7.4
18+	5	1	20.0	3.2
TOTALS	245	27	11.0%	100.0%

Males and females were equally attacked, each with a rate of 11%. Based on racial immunity, the negro males had the highest case incidence of approximately 19%, then the white males with a case incidence of approximately 13%. The Mexican male population showed a case incidence of 2.5%. (Table III.)





T A B L E   I I I .

MALE POPULATION OF JUVENILE HALL  
As of March 14, 1939.

Showing

DISTRIBUTION OF CLINICAL CASES BY RACE AND INCIDENCE

RACE	POPULATION	DISTRIBUTION OF TOTAL MALE POPULATION INCIDENCE PERCENT	NUMBER OF CLINICAL CASES	DISTRIBUTION OF CASE INCIDENCE AS TO RACE PERCENT
WHITE	101	65.1	13	12.8
MEXICAN	38	24.5	1	2.6
NEGRO & OTHERS	16	10.3	3	18.8
TOTALS	155	99.9%	17	11.0%

Among the females, the white girls had the highest case rate of 13.6%, then the negroes with an incidence distribution of 11%. No cases occurred among the Mexicans. (Table IV.)

T A B L E   I V .

FEMALE POPULATION OF JUVENILE HALL  
As of March 14, 1939.

Showing

DISTRIBUTION OF CLINICAL CASES BY RACE AND INCIDENCE

RACE	POPULATION	DISTRIBUTION OF TOTAL FEMALE POPULATION INCIDENCE PERCENT	NUMBER OF CLINICAL CASES	DISTRIBUTION OF CASE INCIDENCE AS TO RACE PERCENT
WHITE	66	73.3	9	13.6
MEXICAN	15	16.7	0	-
NEGRO & OTHERS	9	10.0	1	11.1
TOTALS	90	100.0%	10	11.1%





# MISSED CASES:-- DISTRIBUTION

The criterion for the diagnosis of missed cases has been previously described. Patients so discovered gave a history of residence in the institution of at least 10 days, and in most instances, much longer. 6.5% of the institution population were diagnosed as missed cases. (Table V.)

T A B L E V.

## SCARLET FEVER MISSED CASES

Showing

### INCIDENCE DISTRIBUTION BY AGE GROUPS

AGE IN YEARS	POPULATION	NUMBER OF CASES	CASE INCIDENCE DISTRIBUTION PERCENT	PERCENT DISTRIBUTION OF TOTAL CASES
- 8	13	1	7.7	6.3
8	6	0	-	-
9	7	0	-	-
10	7	0	-	-
11	8	0	-	-
12	6	0	-	-
13	22	3	13.6	18.8
14	44	4	9.1	25.0
15	71	4	5.6	25.0
16	38	3	8.0	18.8
17	18	0	-	-
18+	5	1	20.0	6.3
TOTALS	245	16	6.5%	100.2%

The case incidence was four times higher amongst the male (9.0%) as contrasted to that of the females (2.2%). A possible explanation would be that the boys complained less or perhaps did not care to be bothered in reporting their mild illnesses.





POSITIVE CULTURES FOR HEMOLYTIC STREPTOCOCCI:--- DISTRIBUTION

A culture for hemolytic streptococcus was taken in any child who had a history of recent sore throat, exposure to a clinical or missed case of scarlet, and who at time of examination showed either some injection or a punctate rash of the palate, or a tonsillitis. Approximately 14% of the population thus segregated had positive throat cultures. (Table VI.)

T A B L E VI.

POSITIVE THROAT CULTURES FOR HEMOLYTIC STREPTOCOCCI  
CASES WITH RECENT HISTORY OF SORE THROAT AND SCARLET CONTACT

Showing

INCIDENCE DISTRIBUTION BY AGE GROUPS

AGE IN YEARS	POPULATION	NUMBER OF CASES	CASE INCIDENCE DISTRIBUTION PERCENT	PERCENT DISTRIBUTION OF TOTAL CASES
- 8	13	0	-	-
8	6	0	-	-
9	7	1	14.3	2.8
10	7	0	-	-
11	8	0	-	-
12	6	1	16.2	2.8
13	22	6	27.2	17.0
14	44	6	13.6	17.0
15	71	10	14.0	28.5
16	38	8	21.0	22.8
17	18	2	11.0	5.7
18+	5	1	20.0	2.8
TOTALS	245	35	14.3%	99.4%

The case incidence among the females was 11% as contrasted to that of approximately 16% among the males. Sixty-five children were cultured, of which thirty-five cases, or 54% were reported positive for hemolytic streptococci.

A summary of the various types of hemolytic streptococci infections showing the incidence distribution by individual years and five year age groups, are shown graphically. (Graphs D and E)





INCIDENCE DISTRIBUTION  
OF JUVENILE HALL POPULATION BY YEARS OF AGE  
AND SHOWING WITHIN EACH AGE

THE  
NUMBER OF CASES OF CLINICAL SCARLET FEVER  
NUMBER OF CASES OF MISSED SCARLET FEVER  
NUMBER OF CASES WITH POSITIVE CULTURES  
FOR HEMOLYTIC STREPTOCOCCI

LEGEND:

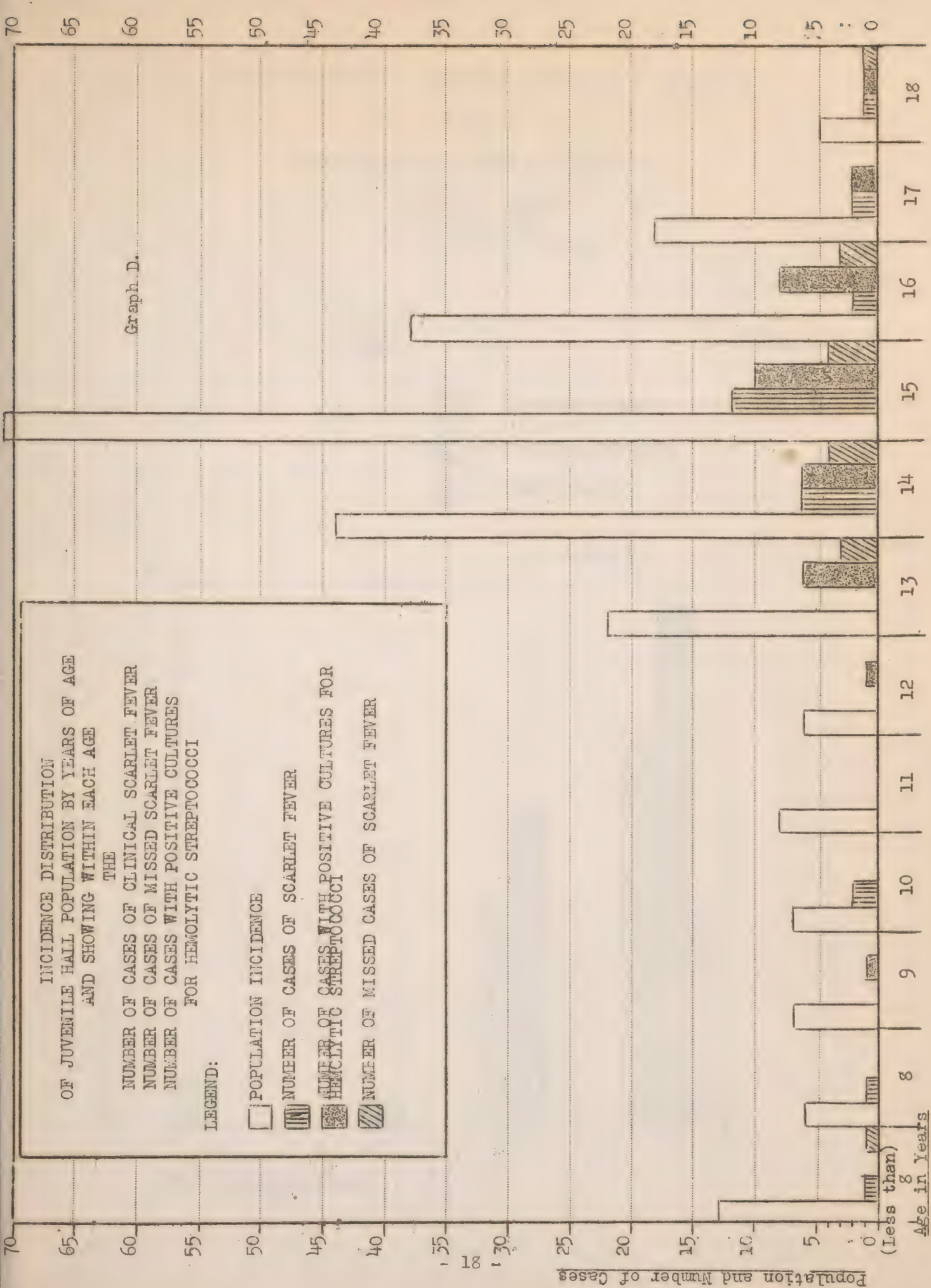
□ POPULATION INCIDENCE

▨ NUMBER OF CASES OF SCARLET FEVER

▩ NUMBER OF CASES WITH POSITIVE CULTURES FOR  
HEMOLYTIC STREPTOCOCCI

▤ NUMBER OF MISSED CASES OF SCARLET FEVER

Graph D.







# TOTAL INCIDENCE OF HEMOLYTIC STREPTOCOCCI INFECTIONS

Showing

DISTRIBUTION BY 5 YEAR AGE GROUPS OF:

CLINICAL CASES

MISSED CASES

POSITIVE CULTURES

LEGEND:



CLINICAL CASES

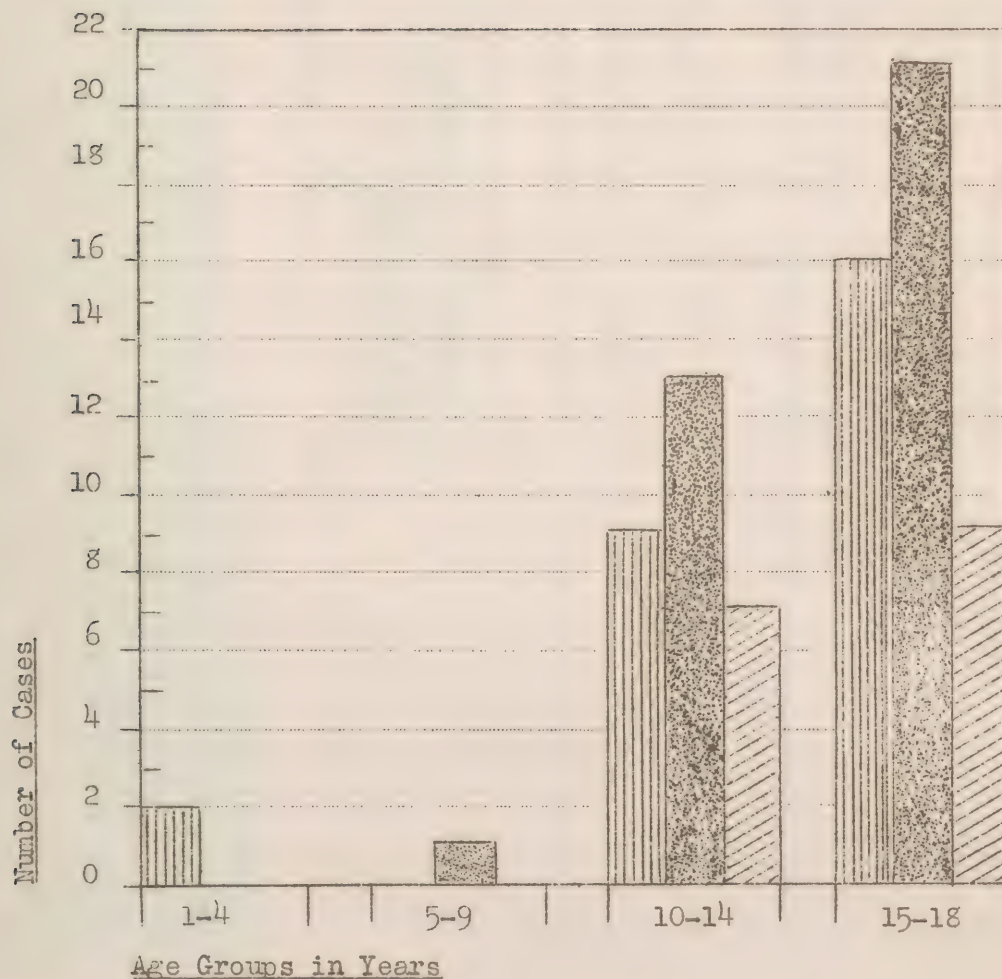


POSITIVE CULTURES



MISSED CASES

Graph E





DISTRIBUTION BY RESIDENCE IN INSTITUTION

The higher case incidence were in the age groups of 15 years or older. Among the boys, Companies A and B, accounted for approximately 84% of all cases. Among the girls, approximately 63% occurred among the residents of the Girls' department. The total distribution of cases can be noted in TABLE VII. Graphs 7-A and 7-B which shows the population of the various living quarters of each group and the incidence within each of the clinical cases, missed cases and cases of positive hemolytic streptococci cultures.

TABLE VII.

ANALYSIS OF EACH COMPANY OF INSTITUTION SHOWING FOR EACH UNIT:-- (1) Population; (2) Incidence of clinical cases of scarlet fever; (3) Incidence of missed cases of scarlet fever; (4) Incidence of positive cultures of hemolytic streptococci; (5) Total incidence of all hemolytic streptococci infections.

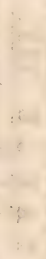
RESIDENCE IN	POPULATION PER UNIT	PERCENT OF TOTAL DISTRIBUTION	NUMBER OF CASES OF CLINICAL S.F.	PERCENT OF TOTAL DISTRIBUTION	CASE INCIDENCE DISTRIBUTION PERCENT	NUMBER OF CASES MISSED SCARLET	PERCENT OF TOTAL DISTRIBUTION	CASE INCIDENCE DISTRIBUTION PERCENT	NUMBER OF CASES OF POSITIVE CULTURE	PERCENT OF TOTAL DISTRIBUTION	CASE INCIDENCE DISTRIBUTION PERCENT	NO. CASES ALL TYPES OF HEMOLYTIC STREPT. INFECTION	PERCENT OF TOTAL DISTRIBUTION	CASE INCIDENCE DISTRIBUTION PERCENT
MALE														
CO. "A"	55	22.45	6	22.2	11.0	7	43.7	12.7	8	22.8	14.5	21	26.8	38.0
MALE														
CO. "B"	54	22.0	6	22.2	11.1	6	37.5	11.1	14	40.0	26.0	26	33.3	48.0
MALE														
CO. "C"	28	11.4	2	7.4	7.0	0	-	-	3	8.6	10.7	5	6.4	18.0
HOSPITAL SEGREGATION GROUPS(MALE)	14	5.7	3	11.0	21.0	1	6.2	7.0	0	-	-	4	5.1	28.5
GIRLS DEPT. (FEMALES)	40	16.3	6	22.2	15.0	2	12.4	5.0	6	17.1	15.0	14	17.8	35.0
JUNIOR COTTAGE (MIXED)	25	9.4	3	11.0	13.0	0	-	-	2	5.7	9.0	5	6.4	22.0
NIGHTINGALE UNIT (FEMALES)	23	9.4	1	3.7	4.3	0	--	-	2	5.7	9.0	3	3.8	13.0
NEW HOSPITAL ADMISSIONS	8	3.2	0	-	-	0	-	-	0	-	-	0	-	0
GRAND TOTALS	245		27		11%	16		6.5%	35		14.3%	78		31.8%



# STUDY OF THE EFFECT OF TEMPERATURE ON THE RATE OF REACTION

The rate of reaction is affected by temperature. The rate of reaction increases as the temperature increases. This is because the molecules have more energy and move faster, so they collide more often and with more force. The rate of reaction also increases as the concentration of the reactants increases. This is because there are more molecules to collide. The rate of reaction also increases as the surface area of the reactants increases. This is because there is more area for the molecules to collide. The rate of reaction also increases as the catalyst increases. This is because the catalyst provides a lower energy path for the reaction.

For the purpose of this experiment, the reaction between hydrogen peroxide and potassium iodide was used. The reaction is as follows:



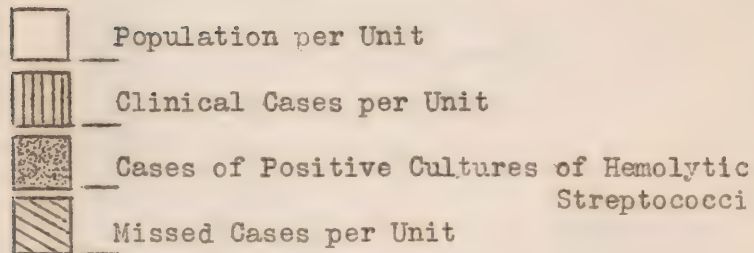
Time (s)	Volume of gas (cm <sup>3</sup> )	Rate of reaction (cm <sup>3</sup> /s)	Temperature (°C)	Concentration (mol/dm <sup>3</sup> )	Surface area (cm <sup>2</sup> )	Catalyst (g)
0	0	0	20	0.1	10	0
10	10	1.0	20	0.1	10	0
20	20	1.0	20	0.1	10	0
30	30	1.0	20	0.1	10	0
40	40	1.0	20	0.1	10	0
50	50	1.0	20	0.1	10	0
60	60	1.0	20	0.1	10	0
70	70	1.0	20	0.1	10	0
80	80	1.0	20	0.1	10	0
90	90	1.0	20	0.1	10	0
100	100	1.0	20	0.1	10	0
110	110	1.0	20	0.1	10	0
120	120	1.0	20	0.1	10	0
130	130	1.0	20	0.1	10	0
140	140	1.0	20	0.1	10	0
150	150	1.0	20	0.1	10	0
160	160	1.0	20	0.1	10	0
170	170	1.0	20	0.1	10	0
180	180	1.0	20	0.1	10	0
190	190	1.0	20	0.1	10	0
200	200	1.0	20	0.1	10	0

CASE DISTRIBUTION  
of  
OUTBREAK AMONG THE FEMALES  
by  
INDIVIDUAL LIVING QUARTERS SHOWING FOR EACH UNIT THE

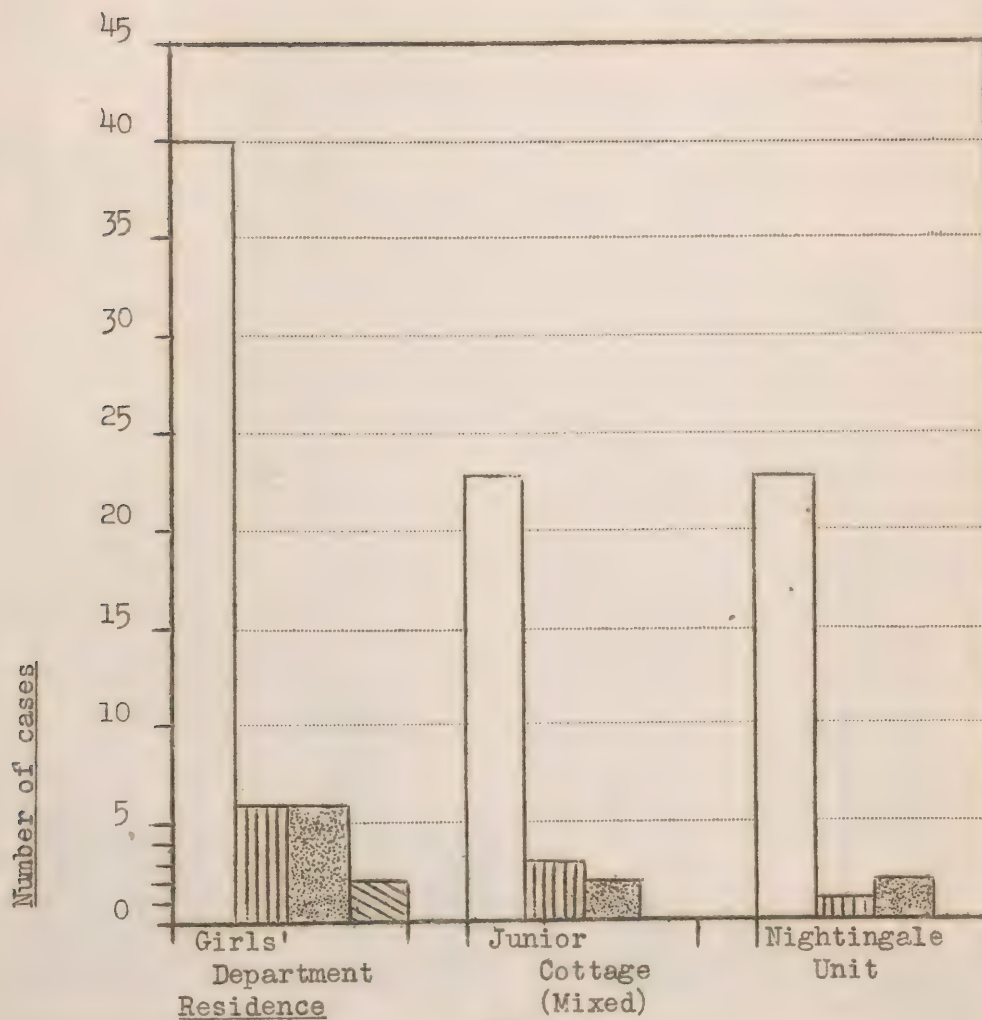
Population

Number of Missed Cases

Number of Positive Cultures of  
Hemolytic streptococci



Graph 7-A







CASE DISTRIBUTION OF OUTBREAK AMONG THE MALES  
BY INDIVIDUAL LIVING QUARTERS  
SHOWING FOR EACH UNIT THE:

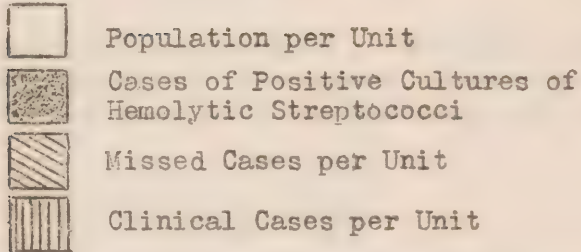
Population

Number of Clinical Cases

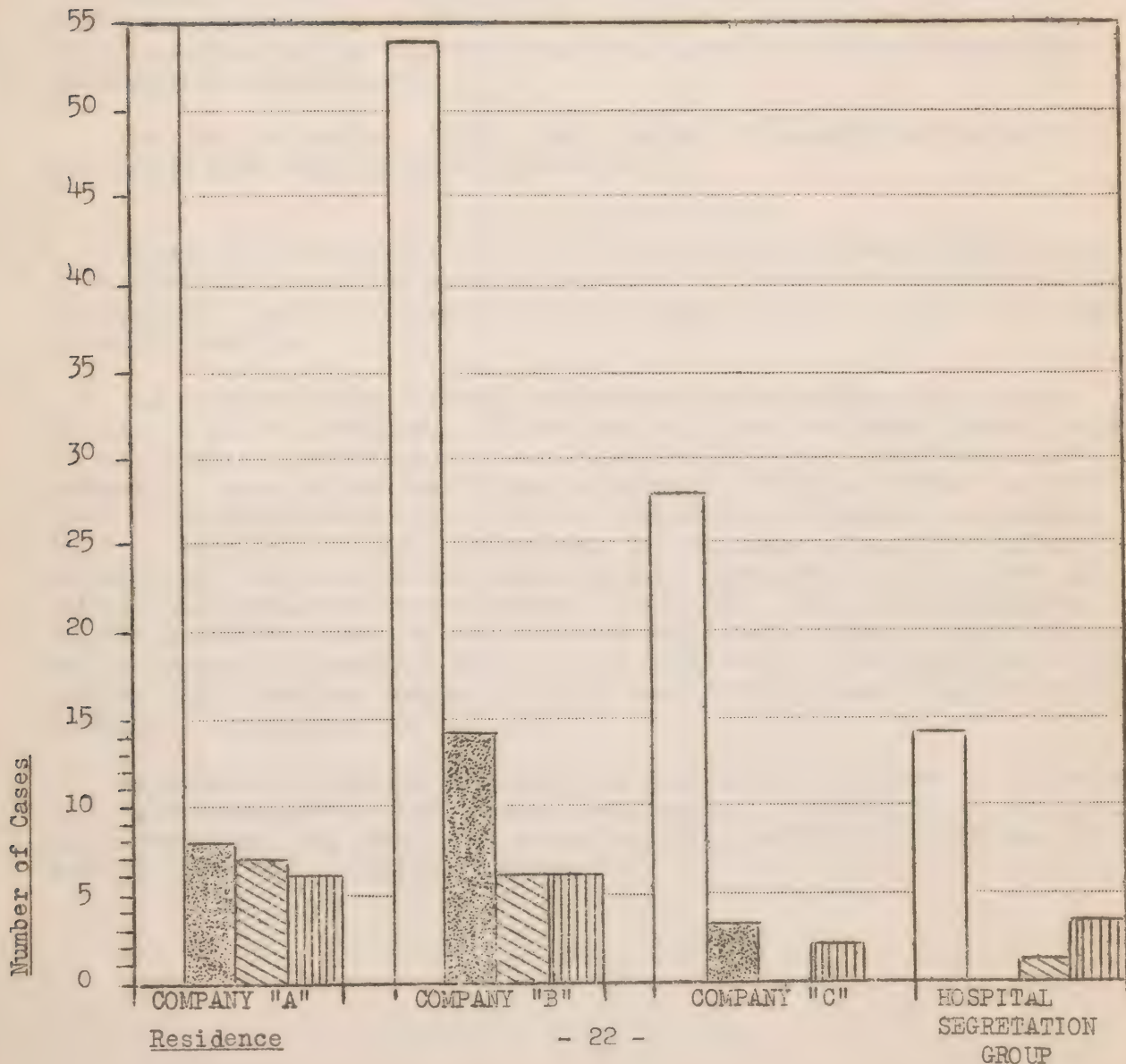
Number of Missed Cases

Number of Cases of Positive Cultures of  
Hemolytic Streptococci.

LEGEND:



Graph 7-B





### PAST HISTORY OF SCARLET FEVER

Eighty per cent of the population interviewed gave a negative history for scarlet fever. Eighty-nine per cent of the males and approximately eighty-six per cent of the females reported a negative history of scarlet fever prior to their admittance to the institution.

Some of the groups were numerically small, therefore, judgment must be reserved as to the significance of the figures. Furthermore, the reliability of the histories from some of the inmates must be given due consideration.

### HISTORY OF SORE THROAT

Twenty-two per cent of the institution population had a history of sore throat at least ten days prior to the investigation. Cultures for hemolytic streptococci, however, were negative. In many cases, it was the impression that to take cultures could serve no purpose because the inflammation had subsided.

Amongst the females, 35.5% gave a history of recent sore throat as contrasted with only 14% among the males.

\* \* \* \* \*

Epidemiologically, all clinical cases of scarlet fever, missed cases of scarlet and cases with positive cultures for hemolytic streptococci, in our opinion, should be considered as one group, namely, a hemolytic streptococci infection.

The absence of the rash did not exclude the case from the series. Such cases are as contagious, if not more so, than the frank clinical case. In this outbreak such instances were undoubtedly a very great source of contagion. Amongst the institution population, 17.5% had either scarlet fever, or were missed cases. With one exception each person had resided eight or more days in the institution. If all cases of positive culture of hemolytic streptococci are included, then approximately 32% of the institutional population were affected. (Table VII) The high attack rate, and the explosive nature of the outbreak could not have been due solely to the occurrence of secondary cases in the institution. The isolation of the various units were too complete and the case distribution too generalized throughout the institution.

Consequently, serious consideration must be given to some food serving as a vehicle of more or less common distribution. An analysis of the daily menus were made, and particular attention given to the foods consumed three days prior to the explosive outbreak.





## M E N U S

Wednesday, March 1, 1939

### BREAKFAST

Grapefruit  
Cornflakes  
B & B  
Cocoa

### DINNER

Chili Beans & Hamburger  
Creamed celery  
Corn bread - jam  
Fruit jello  
B & B  
Milk

### SUPPER

Weiners and mustard  
Green onions  
Butter peas  
Oranges & graham crackers  
B & B  
Milk

Thursday, March 2, 1939

Apple sauce  
Hominy grits  
B & B  
Milk

Pot roast of beef  
Gravy  
Dressing  
Spinach  
Ice Cream - Choc. sauce  
B & B  
Milk

Lettuce - Onion salad  
Buttered carrots  
Baked sweet potatoes  
Prunes - cookies  
B & B  
Milk

Friday, March 3, 1939

Oranges  
All bran  
B & B  
Cocoa

Salad bowl  
Baked fish  
String beans  
Chocolate pudding  
Cookies  
B & B  
Milk

Potato salad  
Bran muffins  
Stewed tomatoes  
Pears  
B & B  
Cocoa

Saturday, March 4, 1939

Grapefruit  
All bran  
B & B  
Cocoa

Cottage cheese-diced pears  
Creamed hard boiled  
eggs & peas  
Corn bread  
Boiled custard  
B & B  
Milk

Peanut butter  
Chilled celery and  
carrot sticks  
Escalloped corn  
Apples  
B & B  
Milk





Sunday, March 5, 1939

BREAKFAST

Sliced Bananas  
Shredded wheat  
B & B  
Milk  
Coffee

DINNER

Waldorf salad  
Roast veal  
Candied sweets  
Ice Cream  
Cauliflower  
B & B  
Milk

SUPPER

Lettuce sandwich  
Jam sandwich  
Cheese, sliced thin  
Fresh pears  
Gingerbread  
B & B  
Cocoa

Monday, March 6, 1939

Oranges  
Grape nuts  
B & B  
Milk

Cole slaw with diced  
pineapple  
Mashed potatoes  
Veal gravy  
Creamed Onions  
Fresh apples  
Chocolate Cake  
B & B - Milk

Stewed tomatoes  
Creamed hamburger  
Chilled celery  
Bread pudding with  
raisins  
B & B  
Milk

Tuesday, March 7, 1939

Stewed apples  
Cornflakes  
Toast  
Cocoa

Meat loaf  
Boiled potatoes  
Spinach  
Dill pickle  
Prunes  
Ginger snaps  
B & B - Milk

Vegetable soup  
Cheese-crackers  
Bran muffins  
Fruit jello  
B & B  
Milk

DISTRIBUTION OF FOOD SUSPECTED FOR OUTBREAK

Certain foods were selected which, in our opinion, may have served as a vehicle for the outbreak. Foods considered most likely to be responsible, were - ice cream, milk, custards, gelatin, puddings and cheese. Each child was questioned to ascertain their likes and dislikes relative to the enumerated foods, under home and institutional environment. The reliability of the data is problematical, but due to the large number interviewed, it may be considered as a cross-section index of the foods an average child would like. Therefore, we believe such a correlation in order. One hundred per cent of the children liked and ate ice cream; approximately 98% drank milk or liked it well enough to drink it routinely; approximately 85% liked and ate custards; 83% liked and ate gelatin preparations; puddings were relished by 82%; but, approximately 77% liked or ate cottage cheese. (Table VIII, Graphs 8-A.) The distribution of all foods were fairly uniform and no definite conclusions could be made and no single food incriminated. In those instances where a variation was appreciable, the number of cases were small. For the same reasons, no significant variations were noted, if the consumption of foods were studied according to the sex of the children.



T A B L E VIII.

FOODS SUSPECTED FOR OUTBREAK

Showing by

SEX

THE DISTRIBUTION OF VARIOUS FOODS LIKED OR DISLIKED AS OBTAINED BY QUESTIONING POPULATION OF INSTITUTION.\*

SEX	POPULATION	DISTRIBUTION OF TOTAL POPULATION	ICE CREAM	CONSUMED PERCENT	MILK	CONSUMED PERCENT	CUSTARDS	CONSUMED PERCENT	GELATIN	CONSUMED PERCENT	PUDDINGS	CONSUMED PERCENT	CHEESE	CONSUMED PERCENT
MALES	155	63.0	155	100.0	150	97.0	128	82.5	138	89.0	129	84.2	118	76.1
FEMALES	90	37.0	90	100.0	90	100	80	88.8	86	95.5	73	81.0	70	77.7
TOTALS	245	100%	245	100%	240	97.9%	208	84.7%	204	83.2%	202	82.4%	188	76.7

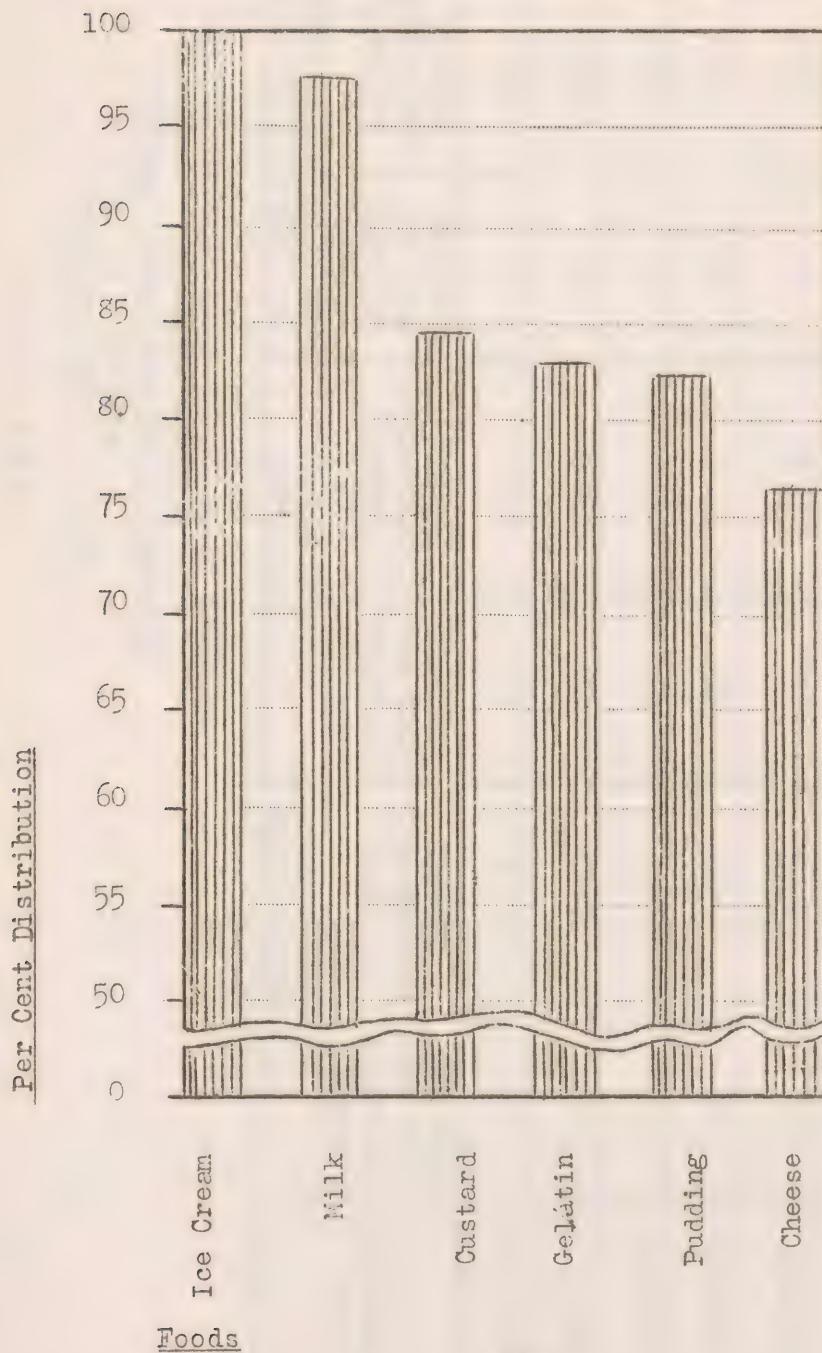
\*Consideration given as to whether child ordinarily ate foods when at home, and whether or not the foods were eaten week previous to outbreak as per menus.





FOODS SUSPECTED FOR OUTBREAK  
 Showing  
 PERCENT DISTRIBUTION  
 of  
 VARIOUS FOODS LIKED OR DISLIKED AS OBTAINED FROM MENUS  
 Among  
 THE POPULATION OF THE INSTITUTION.

Graph 8-A







Based on the population of the institution, the correlation of the suspected foods to the total incidence of hemolytic streptococci infection (scarlet fever, missed cases of scarlet fever, positive cultures for hemolytic streptococci) showed an incidence of rather uniform distribution. (TABLE IX.)

T A B L E IX.

VARIOUS FOODS SUSPECTED  
Showing  
INCIDENCE OF CONSUMPTION AS RELATED  
To distribution of  
OUTBREAK OF HEMOLYTIC STREPTOCOCCI INFECTION.

FOOD SUSPECTED	27 CLINICAL CASES SCARLET FEVER		16 MISSED CASES SCARLET FEVER		35 CASES POS. CULTURE HEMOLYTIC STREPTOCOCCI		TOTALS IN 78 CASES OF STREPTOCOCCI INFECTIONS	
	NUMBER INSTANCES FOOD WAS CONSUMED	INCIDENCE DISTRIBUTION PERCENT	NUMBER INSTANCES FOOD WAS CONSUMED	INCIDENCE DISTRIBUTION PERCENT	NUMBER INSTANCES FOOD WAS CONSUMED	INCIDENCE DISTRIBUTION PERCENT	NUMBER INSTANCES FOOD WAS CONSUMED	INCIDENCE DISTRIBUTION PERCENT
ICE CREAM	27	100.0	16	100.0	35	100.0	78	100.0
MILK	26	95.0	16	100.0	35	100.0	77	98.7
CUSTARD	25	92.6	13	81.0	28	80.0	66	84.3
GELATIN	25	95.0	16	100.0	34	97.0	75	96.1
PUDDING	21	78.0	15	94.0	27	77.0	63	80.5
CHEESE	22	81.0	9	56.0	24	68.0	55	70.5

Based on the children's answers, as to the foods generally liked or disliked, the incidence of distribution of the incriminated foods showed extremely little variation. One or several suspected foods may have been responsible for approximately 32% of the institution population becoming infected with a hemolytic streptococci infection. No single food can be incriminated as being solely responsible for the outbreak.





## DISCUSSION and CONCLUSIONS

An outbreak of scarlet fever occurred in a county institution for juvenile delinquents, having a daily population of approximately 250 children, and an annual population turnover of approximately 4500.

The average stay of a child in the institution was about 17 days, during which period various psychiatric tests and other examinations were accomplished. Since no resident physician resides on the grounds, there was ample opportunity for cases of scarlet fever to have occurred and remain undetected for some time. Despite routine observation by the institution personnel, no daily recording of temperatures or systematic search was conducted for evidence of missed cases of scarlet.

Investigation revealed that similar epidemics have occurred in previous years, but while these outbreaks were brought under control no intensive survey was made and new outbreaks reoccurred. The prime cause of past epidemics was unknown, but it was likely that the underlying cause in all instances was essentially the same ---- food. Too many cases occurred within a short period of time for each outbreak to have been the result of secondary cases.

Emergency measures as outlined in this report were instituted and the outbreak subsided immediately. Milk, at first, was considered to be the causative agent. Investigation revealed that the source of the milk supply was satisfactory, that it was properly pasteurized, and other consumers had failed to develop cases of scarlet or streptococcic sore throats. It is possible, and not improbable, that by the method of pouring and serving as described, the bulk milk may have been contaminated at the institution after delivery. The ice cream supply was investigated, but other sources receiving the same supply reported no cases of scarlet or streptococcic sore throat. The same inference concerning the handling and contamination may be made for this product as for the milk.

Favorable opportunities for contamination was provided by the method described, of cooling and storing the custards and puddings. The explosive nature of the outbreak suggested that some food or foods served as the modus operandi for the hemolytic streptococci infection. Contamination of the described desserts could act in such a capacity. After cooling, the dessert was exposed to room temperature from four to eight hours, before serving. One of the boys acting as a kitchen helper, but having a sore throat or a parochynia or during the stage of being a missed or clinical case of scarlet, could very readily, by having sampled the dessert, have contaminated the product. Several who worked in the kitchen as helpers had otitis media, or parochynia, which on culture were positive for hemolytic streptococci.

Another likely method of contamination was the practice of one or more boys drinking from a milk pitcher, infecting it; then pouring the contaminated milk in the larger containers, thus contaminating the entire supply. Subsequently, if this contaminated milk was allowed to stand either open





or covered at room temperature until the next meal, it furnished a good culture media for the streptococci. The sterilization efficiency is not questioned, but the personnel management for this procedure must be considered. The infecting dose in the containers must have been unusually heavy to cause such an explosive outbreak, but a mild outbreak could have resulted if the dosage was small, such as might be caused by only a preliminary washing of the container before the milk was poured.

This outbreak was caused by a common source of contamination. Secondary contacts, however, as a possible means of spreading the infection must not be overlooked. Several clinical cases and two cases of missed scarlet occurred within six days of the explosive outbreak. If contact spread was a factor, then the outbreak should have been limited to the several companies in which the male cases resided, and not have equally involved the female population of the institution. They had a case incidence identical with that of the male population. In spite of the fact that sex and age segregation was strictly enforced, there was no distinctive features in the distribution amongst these factors. Additional significance was the fact that the early case of scarlet and the two boys which were detected as missed cases of scarlet had all been working in the kitchen as food handlers.

Ingraham, Ramsey, et al, of New York State Health Department, in previous investigations reported streptococcic epidemics to have a mean incubation period of from 60 to 65 hours, with extremes ranging from 12 to 137 hours.

The kitchen helper who became ill on March 6th had a positive culture for hemolytic streptococci. On the same date, another helper developed clinical scarlet. With an incubation of approximately 48 hours, either case could have acted as a source of infection that resulted in the type of an outbreak encountered. If secondary cases were a factor, further cases should have continued for some days, and another wave of scarlet fever should have occurred within five to seven days after the apparent subsidence of the first outbreak. Furthermore, the incidence in the companies where previous cases had existed should have been higher. The failure of these events indicated a food borne outbreak. The higher incidence of missed cases among the males of 4:1 suggested that trouble was brewing in Companies A and B for some time. There may have been secondary cases, but which had been overlooked previous to the current explosive outbreak. If this theory is valid, then contamination of the food becomes very probable. Added weight is given to this theory by the fact of a higher case incidence regardless of residence and sex, that occurred in the older age groups of 15 years and over.

About ten days prior to the outbreak approximately 22% of the population gave a history of variable degree of sore throats. Whether or not infective doses of streptococci were being ingested through some food, but in quantities insufficient to cause an explosive outbreak is only conjectural. Bradley, in a study in New York City, estimated that 20% of a population group were carriers of hemolytic streptococci. In familial contacts a condition analogous to that in this institution, the hemolytic streptococci carrier rate could be as high as 57%.





An analysis of the various foods suspected showed no significant variations in their per cent of distribution. The only conclusion which can be drawn is that approximately 32% of the institution population were affected in the outbreak investigated, and that any one or combination of six suspected foods surveyed could have been responsible for an epidemic of hemolytic streptococci as investigated and herein reported.

#### RECOMMENDATIONS FOR THE FUTURE

1. That a resident physician be on the grounds to assist in detecting and isolating early cases of sore throat and suspicious rashes.
2. To take and record temperature readings twice a day, preferably during the late morning and early evening. If a temperature above 99.6°F. be detected, the child should be isolated at once and kept under observation for further developments. Any child who seems indisposed but who does not have a temperature at the time of examination should also be isolated.
3. To have one or preferably two nurses make the routine daily inspections and temperature readings. Eventually, they would develop a clinical acumen and prove of invaluable assistance to the physicians and the institution.
4. Segregation in the clinics, as much as possible, of all children residing in the institution and those appearing for study from outside agencies.
5. All milk to be served in bottles, properly capped, and consumed through a straw. Bulk milk to be used only for cooking. Such procedures would conform to the provisions prescribed in the California Agricultural Code.
6. Custards, puddings or any product of a similar nature should not be allowed to cool under conditions herein described. Some arrangement should be made to protect the foods from contamination and, if possible, to refrigerate at all times.
7. To discontinue the assistance of boys working in the kitchen as food handlers.
8. Attendants to be instructed in communicable disease management, as practiced in the Los Angeles County Hospital. Such a procedure would inculcate a sense of keener observation among the personnel, and undoubtedly reduce cross infections to a minimum.

#### ACKNOWLEDGEMENTS

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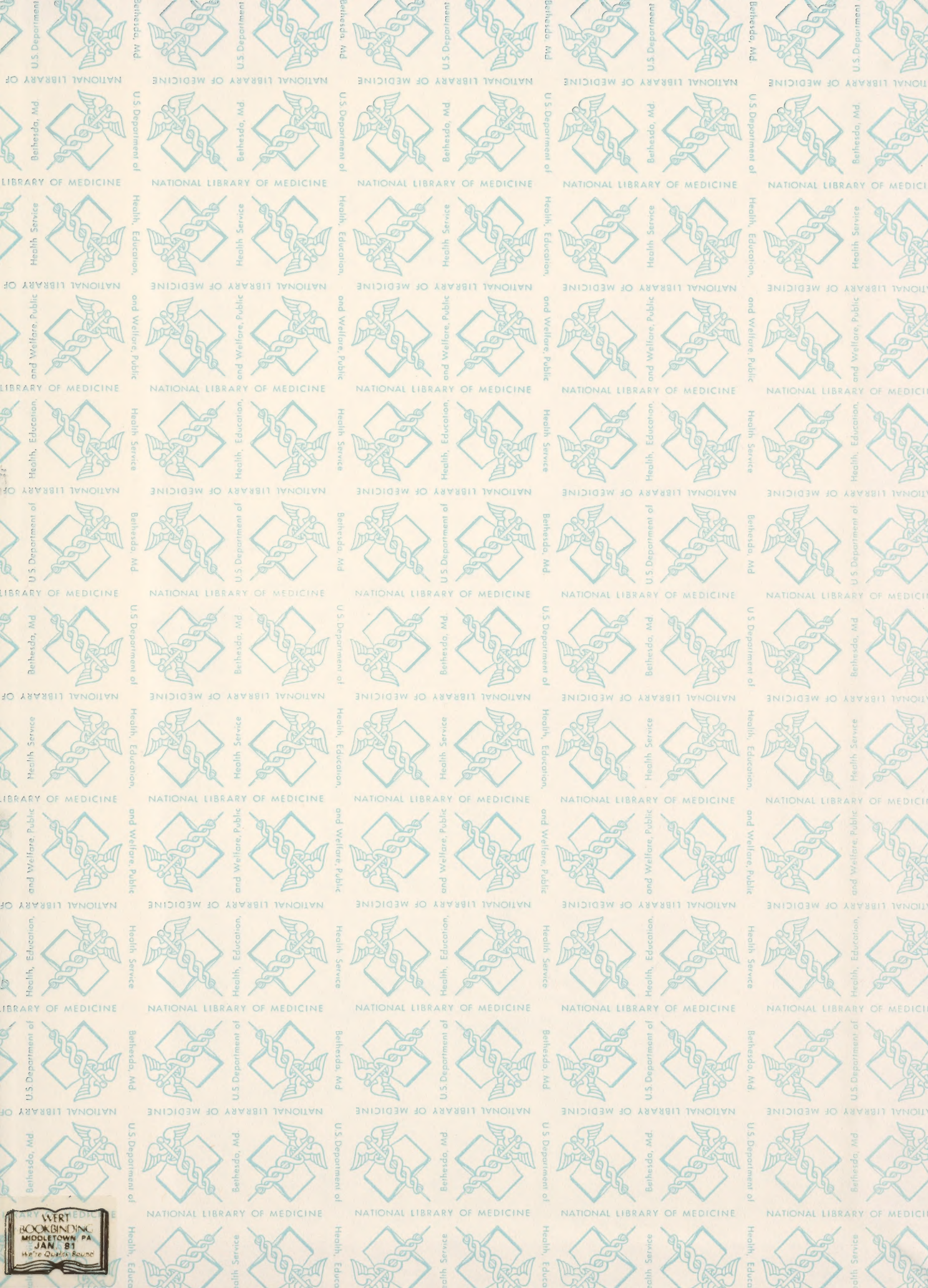












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